

Unit 16

Day 3

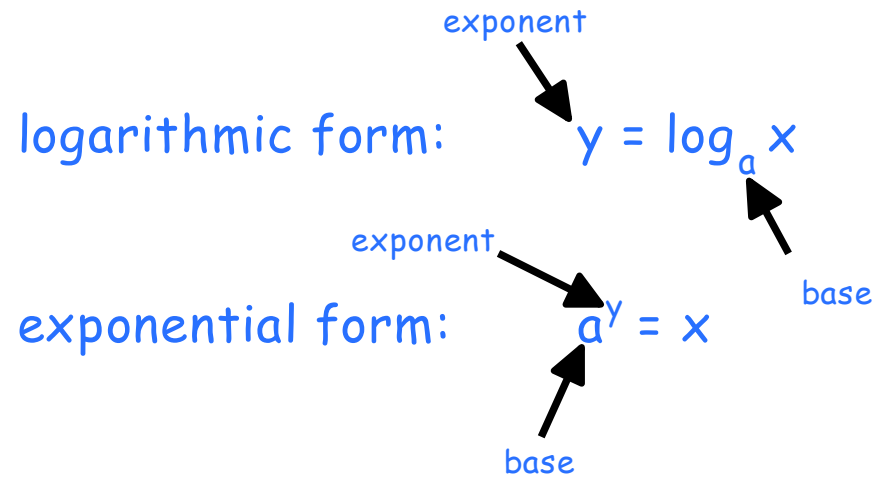
The Logarithmic Function

Section 5.3

LOGARITHM

For all real numbers y , and all positive numbers a and x , where $a \neq 1$;

$$y = \log_a x \text{ if and only if } x = a^y$$



Theorem on Logarithmic Inverses

For $a > 0$, $a \neq 1$:

$$a^{\log_a x} = x \quad \text{and} \quad \log_a (a^x) = x$$

For each statement, write an equivalent statement in exponential form.

logarithmic form

exponential form

1) $-2 = \log_{10} .01 \longrightarrow 10^{-2} = .01$

2) $\log_2 \sqrt{8} = \frac{3}{2} \longrightarrow 2^{\frac{3}{2}} = \sqrt{8}$

3) $\log_{\frac{4}{3}} \frac{3}{4} = -1 \longrightarrow \left(\frac{4}{3}\right)^{-1} = \frac{3}{4}$

For each statement, write an equivalent statement in logarithmic form.

exponential form

logarithmic form

4) $2^{10} = 1024$

$$\log_2 1024 = 10$$

5) $\left(\frac{1}{625}\right)^{\frac{1}{4}} = \frac{1}{5}$

$$\log_{\frac{1}{625}} \frac{1}{5} = \frac{1}{4}$$

6) $12^0 = 1$

$$\log_{12} 1 = 0$$

Find the value of each expression.

7)

$$\log_{10} .0001 = y$$

$$10^y = .0001$$

$$10^y = \frac{1}{10000}$$

$$10^y = 10^{-4}$$

$$y = -4$$

8)

$$\log_4 \frac{1}{8} = x$$

$$4^x = \frac{1}{8}$$

$$2^{2x} = 8^{-1}$$

$$2^{2x} = 2^{-3}$$

$$2x = -3$$
$$x = -3/2$$

Find the value of each expression.

9)

$$\log_3 \sqrt{3} = a$$

$$3^a = \sqrt{3}$$

$$3^a = 3^{1/2}$$

$$a = \frac{1}{2}$$

10)

$$\log_4 -1 = y$$

$$4^y = -1$$

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Solve for x.

11)

$$\log_x \frac{1}{27} = -3$$

$$x^{-3} = \frac{1}{27}$$

$$x^{-3} = (3)^{-3}$$

$$x = 3$$

12)

$$\log_5 x = 4$$

$$5^4 = x$$

$$625 = x$$

Solve for x.

13) $x = 5^{\log_5 17}$

14) $y = 13^{\log_{13} 80}$

HOMEWORK

Unit 16

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p. 381-382: 1-16, 19-30